Agency for Healthcare Research and Quality
Advancing Excellence in Health Care

NATIONAL GUIDELINE CLEARINGHOUSE

General

Guideline Title

Screening for lung cancer: U.S. Preventive Services Task Force recommendation statement.

Bibliographic Source(s)

U.S. Preventive Services Task Force (USPSTF). Screening for lung cancer: U.S. Preventive Services Task Force recommendation statement. Ann Intern Med. 2014 Mar 4;160(5):330-8. [21 references] PubMed

Guideline Status

This is the current release of the guideline.

This updates previous versions: U.S. Preventive Services Task Force. Lung cancer screening: recommendation statement. Ann Intern Med. 2004 May 4;140(9):738-9.

Lung cancer screening: recommendation statement. Am Fam Physician. 2005 Mar 15;71(6):1165-8.

This guideline meets NGC's 2013 (revised) inclusion criteria.

Recommendations

Major Recommendations

The U.S. Preventive Services Task Force (USPSTF) grades its recommendations (A, B, C, D, or I) and identifies the levels of certainty regarding net benefit (High, Moderate, and Low). The definitions of these grades can be found at the end of the "Major Recommendations" field.

Summary of Recommendation and Evidence

The USPSTF recommends annual screening for lung cancer with low-dose computed tomography (LDCT) in adults aged 55 to 80 years who have a 30 pack-year smoking history and currently smoke or have quit within the past 15 years. Screening should be discontinued once a person has not smoked for 15 years or develops a health problem that substantially limits life expectancy or the ability or willingness to have curative lung surgery. (B recommendation)

Clinical Considerations

Patient Population Under Consideration

The risk for lung cancer increases with age and cumulative exposure to tobacco smoke and decreases with time since quitting smoking. The best evidence for the benefit of screening comes from the National Lung Screening Trial (NLST), which enrolled adults aged 55 to 74 years who had at least a 30 pack-year smoking history and were current smokers or had quit within the past 15 years. As with all screening trials, the NLST tested

a specific intervention over a finite period. Because initial eligibility extended through age 74 years and participants received 3 annual screening computed tomographic scans, the oldest participants in the trial were aged 77 years.

The USPSTF used modeling studies to predict the benefits and harms of screening programs that use different screening intervals, age ranges, smoking histories, and times since quitting. A program that annually screens adults aged 55 to 80 years who have a 30 pack-year smoking history and currently smoke or have quit within the past 15 years is projected to have a reasonable balance of benefits and harms. The model assumes that persons who achieve 15 years of smoking cessation during the screening program discontinue screening. This model predicts the outcomes of continuing the screening program used in the NLST through age 80 years.

Screening may not be appropriate for patients with substantial comorbid conditions, particularly those at the upper end of the screening age range. The NLST excluded persons who were unlikely to complete curative lung cancer surgery and those with medical conditions that posed a substantial risk for death during the 8-year trial. The baseline characteristics of the NLST showed a relatively healthy sample, and fewer than 10% of enrolled participants were older than 70 years. Persons with serious comorbid conditions may experience net harm, no net benefit, or at least substantially less net benefit. Similarly, persons who are unwilling to have curative lung surgery are unlikely to benefit from a screening program.

Assessment of Risk

Age, total exposure to tobacco smoke, and years since quitting smoking are important risk factors for lung cancer and were used to determine eligibility in the NLST. Other risk factors include specific occupational exposures, radon exposure, family history, and history of pulmonary fibrosis or chronic obstructive lung disease. The incidence of lung cancer is relatively low in persons younger than 50 years but increases with age, especially after age 60 years. In current and former smokers, age-specific incidence rates increase with age and cumulative exposure to tobacco smoke.

Smoking cessation substantially reduces a person's risk for developing and dying of lung cancer. Among persons enrolled in the NLST, those who were at highest risk because of additional risk factors or a greater cumulative exposure to tobacco smoke experienced most of the benefit. A validated multivariate model showed that persons in the highest 60% of risk accounted for 88% of all deaths preventable by screening.

Screening Tests

Low-dose computed tomography has shown high sensitivity and acceptable specificity for the detection of lung cancer in high-risk persons. Chest radiography and sputum cytologic evaluation have not shown adequate sensitivity or specificity as screening tests. Therefore, LDCT is currently the only recommended screening test for lung cancer.

Treatment

Surgical resection is the current standard of care for localized non-small cell lung cancer (NSCLC). This type of cancer is treated with surgical resection when possible and also with radiation and chemotherapy. Annual LDCT screening may not be useful for patients with life-limiting comorbid conditions or poor functional status who may not be candidates for surgery.

Other Approaches to Prevention

Smoking cessation is the most important intervention to prevent NSCLC. Advising smokers to stop smoking and preventing nonsmokers from being exposed to tobacco smoke are the most effective ways to decrease the morbidity and mortality associated with lung cancer. Current smokers should be informed of their continuing risk for lung cancer and offered cessation treatments. Screening with LDCT should be viewed as an adjunct to tobacco cessation interventions.

Useful Resources

Clinicians have many resources to help patients stop smoking. The Centers for Disease Control and Prevention has developed a Web site with many such resources, including information on tobacco quit lines, available in several languages (www.cdc.gov/tobacco/campaign/tips). Quit lines provide telephone-based behavioral counseling and support to tobacco users who want to quit smoking. Counseling is provided by trained cessation specialists who follow standardized protocols that may include several sessions and are generally provided at no cost to users. The content has been adapted for specific populations and can be tailored for individual clients. Strong evidence shows that quit lines can expand the use of evidence-based tobacco cessation treatments in populations that may have limited access to treatment options.

Combination therapy with counseling and medications is more effective at increasing cessation rates than either component alone. The U.S. Food and Drug Administration has approved several forms of nicotine replacement therapy (gum, lozenge, transdermal patch, inhaler, and nasal spray), as well as bupropion and varenicline. More information on the treatment of tobacco dependence can be found in the U.S. Public Health Service

Reference Guide "Treating Tobacco Use and Dependence: 2008 Update" (available at http://www.ahrq.gov/professionals/clinicians-providers/guidelines-recommendations/tobacco/clinicians/treating_tobacco_use08.pdf). The National Cancer Institute has developed a patient and physician guide for shared decision making for lung cancer screening based on the NLST (available at www.cancer.gov/newscenter/qa/2002/NLSTstudyGuidePatientsPhysicians). This 1-page resource may be a useful communication tool for providers and patients.

In addition, the National Comprehensive Cancer Network has developed guidelines for the follow-up of lung nodules. The appropriate follow-up and management of abnormalities found on LDCT scans are important given the high rates of false-positive results and the potential for harms. Lung cancer screening with LDCT should be implemented as part of a program of care, as outlined in the next section.

Definitions:

What the U.S. Preventive Services Task Force (USPSTF) Grades Mean and Suggestions for Practice

Grade	Grade Definitions	Suggestions for Practice
A	The USPSTF recommends the service. There is high certainty that the net benefit is substantial.	Offer/provide this service.
B	The USPSTF recommends the service. There is high certainty that the net benefit is moderate or there is moderate certainty that the net benefit is moderate to substantial.	Offer/provide this service.
C	The USPSTF recommends selectively offering or providing this service to individual patients based on professional judgment and patient preferences. There is at least moderate certainty that the net benefit is small.	Offer/provide this service only if other considerations support offering or providing the service in an individual patient.
D	The USPSTF recommends against the service. There is moderate or high certainty that the service has no net benefit or that the harms outweigh the benefits.	Discourage the use of this service.
I Statement	The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of the service. Evidence is lacking, of poor quality, or conflicting, and the balance of benefits and harms cannot be measured.	Read "Clinical Considerations" section of USPSTF Recommendation Statement (see the "Major Recommendations" field). If the service is offered, patients should understand the uncertainty about the balance of benefits and harms.

USPSTF Levels of Certainty Regarding Net Benefit

Definition: The USPSTF defines *certainty* as "likelihood that the USPSTF assessment of the net benefit of a preventive service is correct." The net benefit is defined as benefit minus harm of the preventive service as implemented in a general, primary care population. The USPSTF assigns a certainty level based on the nature of the overall evidence available to assess the net benefit of a preventive service.

Level of Certainty	Description
High	The available evidence usually includes consistent results from well-designed, well-conducted studies in representative primary care populations. These studies assess the effects of the preventive service on health outcomes. This conclusion is therefore unlikely to be strongly affected by the results of future studies.
Moderate	The available evidence is sufficient to determine the effects of the preventive service on health outcomes, but confidence in the estimate is constrained by factors such as: • The number, size, or quality of individual studies • Inconsistency of findings across individual studies • Limited generalizability of findings to routine primary care practice; and • Lack of coherence in the chain of evidence As more information becomes available, the magnitude or direction of the observed effect could change, and this change may be large enough to alter the conclusion.
Low	The available evidence is insufficient to assess effects on health outcomes. Evidence is insufficient because of: • The limited number or size of studies

Level of Certainty	Description
	• Important flaws in study design or methods • Inconsistency of findings across individual studies • Gaps in the chain of evidence • Findings not generalizable to routine primary care practice; and • A lack of information on important health outcomes More information may allow an estimation of effects on health outcomes.

Clinical Algorithm(s)

None available

Scope

Disease/Condition(s)

Non-small cell lung cancer (NSCLC)

Guideline Category

Counseling

Prevention

Screening

Clinical Specialty

Family Practice

Internal Medicine

Oncology

Preventive Medicine

Pulmonary Medicine

Intended Users

Advanced Practice Nurses

Allied Health Personnel

Nurses

Physician Assistants

Physicians

Public Health Departments

Guideline Objective(s)

- To summarize the current U.S. Preventive Services Task Force (USPSTF) recommendations for screening of lung cancer and the

supporting scientific evidence
- To update the 2004 USPSTF recommendation statement on screening for lung cancer

Target Population

Asymptomatic adults aged 55 to 80 years who have a 30 pack-year smoking history and currently smoke or have quit within the past 15 years

Interventions and Practices Considered

Screening

1. Low-dose computed tomography (LDCT)
2. Chest radiography (not recommended)
3. Sputum cytologic evaluation (not recommended)

Prevention

1. Smoking cessation
2. Counseling on risk for lung cancer

Major Outcomes Considered

- Key Question 1: How effective is screening for lung cancer in reducing mortality and morbidity?
    a. How effective is screening in persons at average risk?
    b. How effective is screening in persons at higher risk for lung cancer (e.g., current or former smokers)?
    c. Does effectiveness differ by subgroups (e.g., sex, age, race, presence of comorbid conditions, other lung cancer risk factors)?
- Key Question 2: What are the test characteristics (sensitivity, specificity, predictive value) of screening tests for lung cancer?
    a. How do these test characteristics vary by lung cancer risk?
    b. How are test characteristics different by subgroups (e.g., sex, age, race)?
- Key Question 3: What are the harms associated with lung cancer screening and are there ways to modify harms (e.g., unnecessary biopsy, radiation exposure, overdiagnosis, and psychosocial harms)?
- Key Question 4: How effective is surgical resection for the treatment of early (stage IA) non-small cell lung cancer (NSCLC)?
- Key Question 5: What are the harms associated with surgical resection of early (stage IA) NSCLC?

Methodology

Methods Used to Collect/Select the Evidence

Hand-searches of Published Literature (Primary Sources)

Hand-searches of Published Literature (Secondary Sources)

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Note from the National Guideline Clearinghouse (NGC): A systematic evidence review was prepared by the Pacific Northwest Evidence-based Practice Center (EPC), Oregon Health & Science University for the U.S. Preventive Services Task Force (USPSTF) (see the "Availability of Companion Documents" field).

Search Strategies

In conjunction with a research librarian, investigators searched the Cochrane Central Register of Controlled Trials and Cochrane Database of Systematic Reviews (through the fourth quarter 2012), MEDLINE (2000 through December 2012), reference lists of papers, and Scopus for relevant English-language studies and systematic reviews. Search strategies are described in Appendix A1 of the evidence synthesis (see the "Availability of Companion Documents" field).

Study Selection

At least two reviewers independently evaluated each study to determine eligibility for inclusion. Investigators selected studies on the basis of inclusion and exclusion criteria developed for each key question (see Appendix A2 of the evidence synthesis [see the "Availability of Companion Documents" field]). Papers were selected for full-text review if they were about lung cancer screening, were relevant to a key question, and met the predefined inclusion criteria. EPC staff restricted inclusion to English-language articles and excluded studies only published as abstracts. Studies of nonhuman subjects were also excluded, and studies had to include original data.

For key questions 1, 2, and 3, the EPC staff included large (n ≥1,000) screening trials and/or studies of adult (age ≥18 years) men and women without signs of lung cancer. The screening interventions were low-dose computed tomography (LDCT), chest x-ray (CXR), sputum cytology, or a combination of these screening interventions. For key questions 4 and 5, they focused on surgical resection of early (stage I) non-small cell lung cancer (NSCLC). Outcomes were mortality, morbidity, impact on smoking cessation, quality of life, incidental findings, and harms from screening (such as false-positives, radiation, and overdiagnosis) and treatment. For key questions 4 and 5, the EPC staff limited the review of treatments to studies involving 500 or more people and those published in the last 12 years, as the interest was in treatment outcomes that are relevant to current practice. Given differences in stage classification, diagnostic procedures used to define stage, and surgical techniques, EPC staff determined studies published before those dates would be unlikely to be generalizable to current clinical practice.

Number of Source Documents

Of the full-text papers reviewed, 63 provided data to answer one or more of the key questions and were included in the evidence review.

- Key questions 1-3: 50 papers (28 randomized controlled trials, 22 cohort studies)
- Key questions 4-5: 13 cohort studies

Methods Used to Assess the Quality and Strength of the Evidence

Expert Consensus

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Investigators used criteria developed by the U.S. Preventive Services Task Force (USPSTF) to rate the quality of each randomized controlled trial (RCT) as good, fair, or poor (see Appendix A3 in the Evidence Synthesis [see the "Availability of Companion Documents" field]).

Methods Used to Analyze the Evidence

Review of Published Meta-Analyses

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

Note from the National Guideline Clearinghouse (NGC): A systematic evidence review was prepared by the Pacific Northwest Evidence-based Practice Center (EPC), Oregon Health & Science University for the U.S. Preventive Services Task Force (USPSTF) (see the "Availability of Companion Documents" field).

Data Extraction and Quality Assessment

For each included study, an investigator abstracted details about the patient population, study design, screening procedure, imaging assessment, analysis, follow-up, and results; data were confirmed by a second investigator. Using predefined criteria developed by the USPSTF, 2 investigators independently rated the quality of trials reporting results for both comparison groups (low-dose computed tomography [LDCT] vs. chest radiography or usual care) as good, fair, or poor; discrepancies were resolved by consensus. When studies reported findings in more than 1 article, data from the most recent publication were used unless unique data were presented in a previous publication.

Data Synthesis and Analysis

The EPC staff did not perform a meta-analysis because of the substantial heterogeneity in the interventions, follow-up intervals, and quality of the trials. The EPC staff created forest plots to display the findings and summarize the data qualitatively. The EPC staff assessed the overall quality of the body of evidence for each key question (good, fair, or poor) using methods developed by the USPSTF on the basis of the number, quality, and size of studies; consistency of results; and directness of evidence.

Methods Used to Formulate the Recommendations

Balance Sheets

Expert Consensus

Description of Methods Used to Formulate the Recommendations

The U.S. Preventive Services Task Force (USPSTF) systematically reviews the evidence concerning both the benefits and harms of widespread implementation of a preventive service. It then assesses the certainty of the evidence and the magnitude of the benefits and harms. On the basis of this assessment, the USPSTF assigns a letter grade to each preventive service signifying its recommendation about provision of the service (see Table below). An important, but often challenging, step is determining the balance between benefits and harms to estimate "net benefit" (that is, benefits minus harms).

Table 1. U.S. Preventive Services Task Force Recommendation Grid*

Certainty of Net Benefit	**Magnitude of Net Benefit**			
	Substantial	**Moderate**	**Small**	**Zero/Negative**
High	A	B	C	D
Moderate	B	B	C	D
Low	Insufficient			

**A, B, C, D,* and *I (Insufficient)* represent the letter grades of recommendation or statement of insufficient evidence assigned by the USPSTF after assessing certainty and magnitude of net benefit of the service (see the "Rating Scheme for the Strength of the Recommendations" field).

The overarching question that the USPSTF seeks to answer for every preventive service is whether evidence suggests that provision of the service would improve health outcomes if implemented in a general primary care population. For screening topics, this standard could be met by a large randomized, controlled trial (RCT) in a representative asymptomatic population with follow-up of all members of both the group "invited for screening" and the group "not invited for screening."

Direct RCT evidence about screening is often unavailable, so the USPSTF considers indirect evidence. To guide its selection of indirect evidence, the USPSTF constructs a "chain of evidence" within an analytic framework. For each key question, the body of pertinent literature is critically appraised, focusing on the following 6 questions:

1. Do the studies have the appropriate research design to answer the key question(s)?
2. To what extent are the existing studies of high quality? (i.e., what is the internal validity?)
3. To what extent are the results of the studies generalizable to the general U.S. primary care population and situation? (i.e., what is the external validity?)
4. How many studies have been conducted that address the key question(s)? How large are the studies? (i.e., what is the precision of the evidence?)

5. How consistent are the results of the studies?
6. Are there additional factors that assist the USPSTF in drawing conclusions (e.g., presence or absence of dose–response effects, fit within a biologic model)?

The next step in the USPSTF process is to use the evidence from the key questions to assess whether there would be net benefit if the service were implemented. In 2001, the USPSTF published an article that documented its systematic processes of evidence evaluation and recommendation development. At that time, the USPSTF's overall assessment of evidence was described as good, fair, or poor. The USPSTF realized that this rating seemed to apply only to how well studies were conducted and did not fully capture all of the issues that go into an overall assessment of the evidence about net benefit. To avoid confusion, the USPSTF has changed its terminology. Whereas individual study quality will continue to be characterized as good, fair, or poor, the term certainty will now be used to describe the USPSTF's assessment of the overall body of evidence about net benefit of a preventive service and the likelihood that the assessment is correct. Certainty will be determined by considering all 6 questions listed above; the judgment about certainty will be described as high, moderate, or low.

In making its assessment of certainty about net benefit, the evaluation of the evidence from each key question plays a primary role. It is important to note that the USPSTF makes recommendations for real-world medical practice in the United States and must determine to what extent the evidence for each key question—even evidence from screening RCTs or treatment RCTs—can be applied to the general primary care population. Frequently, studies are conducted in highly selected populations under special conditions. The USPSTF must consider differences between the general primary care population and the populations studied in RCTs and make judgments about the likelihood of observing the same effect in actual practice.

It is also important to note that one of the key questions in the analytic framework refers to the potential harms of the preventive service. The USPSTF considers the evidence about the benefits and harms of preventive services separately and equally. Data about harms are often obtained from observational studies because harms observed in RCTs may not be representative of those found in usual practice and because some harms are not completely measured and reported in RCTs.

Putting the body of evidence for all key questions together as a chain, the USPSTF assesses the certainty of net benefit of a preventive service by asking the 6 major questions listed above. The USPSTF would rate a body of convincing evidence about the benefits of a service that, for example, derives from several RCTs of screening in which the estimate of benefits can be generalized to the general primary care population as "high" certainty (see the "Rating Scheme for the Strength of the Recommendations" field). The USPSTF would rate a body of evidence that was not clearly applicable to general practice or has other defects in quality, research design, or consistency of studies as "moderate" certainty. Certainty is "low" when, for example, there are gaps in the evidence linking parts of the analytic framework, when evidence to determine the harms of treatment is unavailable, or when evidence about the benefits of treatment is insufficient. Table 4 in the methodology document listed below (see the "Availability of Companion Documents" field) summarizes the current terminology used by the USPSTF to describe the critical assessment of evidence at all 3 levels: individual studies, key questions, and overall certainty of net benefit of the preventive service.

Sawaya GF, Guirguis-Blake J, LeFevre M, Harris R, Petitti D; U.S. Preventive Services Task Force. Update on the methods of the U.S. Preventive Services Task Force: estimating certainty and magnitude of net benefit. Ann Intern Med. 2007;147(12):871-5. [5 references].

Rating Scheme for the Strength of the Recommendations

What the U.S. Preventive Services Task Force (USPSTF) Grades Mean and Suggestions for Practice

Grade	Grade Definitions	Suggestions for Practice
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C	The USPSTF recommends selectively offering or providing this service to individual patients based on professional judgment and patient preferences. There is at least moderate certainty that the net benefit is small.	Offer/provide this service only if other considerations support offering or providing the service in an individual patient.
D	The USPSTF recommends against the service. There is moderate or high certainty that the service has no net benefit or that the harms outweigh the benefits.	Discourage the use of this service.

Grade	Grade Definitions	Suggestions for Practice
I Statement	The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of the service. Evidence is lacking, of poor quality, or conflicting, and the balance of benefits and harms cannot be measured.	Read "Clinical Considerations" section of USPSTF Recommendation Statement (see the "Major Recommendations" field). If the service is offered, patients should understand the uncertainty about the balance of benefits and harms.

USPSTF Levels of Certainty Regarding Net Benefit

Definition: The USPSTF defines *certainty* as "likelihood that the USPSTF assessment of the net benefit of a preventive service is correct." The net benefit is defined as benefit minus harm of the preventive service as implemented in a general, primary care population. The USPSTF assigns a certainty level based on the nature of the overall evidence available to assess the net benefit of a preventive service.

Level of Certainty	Description
High	The available evidence usually includes consistent results from well-designed, well-conducted studies in representative primary care populations. These studies assess the effects of the preventive service on health outcomes. This conclusion is therefore unlikely to be strongly affected by the results of future studies.
Moderate	The available evidence is sufficient to determine the effects of the preventive service on health outcomes, but confidence in the estimate is constrained by factors such as: • The number, size, or quality of individual studies • Inconsistency of findings across individual studies • Limited generalizability of findings to routine primary care practice; and • Lack of coherence in the chain of evidence As more information becomes available, the magnitude or direction of the observed effect could change, and this change may be large enough to alter the conclusion.
Low	The available evidence is insufficient to assess effects on health outcomes. Evidence is insufficient because of: • The limited number or size of studies • Important flaws in study design or methods • Inconsistency of findings across individual studies • Gaps in the chain of evidence • Findings not generalizable to routine primary care practice; and • A lack of information on important health outcomes More information may allow an estimation of effects on health outcomes.

Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

Method of Guideline Validation

Comparison with Guidelines from Other Groups

External Peer Review

Internal Peer Review

Description of Method of Guideline Validation

Peer Review. Before the U.S. Preventive Services Task Force (USPSTF) makes its final determinations about recommendations on a given preventive service, the Evidence-based Practice Center and the Agency for Healthcare Research and Quality send a draft evidence review to 4 to 6 external experts and to Federal agencies and professional and disease-based health organizations with interests in the topic. The experts are asked to examine the review critically for accuracy and completeness and to respond to a series of specific questions about the document. After

assembling these external review comments and documenting the proposed response to key comments, the topic team presents this information to the USPSTF in memo form. In this way, the USPSTF can consider these external comments before it votes on its recommendations about the service. Draft recommendation statements are then circulated for comment among reviewers representing professional societies, voluntary organizations, and Federal agencies, as well as posted on the USPSTF Web site for public comment. These comments are discussed before the final recommendations are confirmed.

Response to Public Comment. A draft version of this recommendation statement was posted for public comment on the USPSTF Web site from 30 July to 26 August 2013. Most of the comments generally agreed with the recommendation statement, although some suggested restricting screening to a higher-risk group and others suggested expanding eligibility criteria beyond those used in the National Lung Screening Trial (NLST). Many comments expressed concerns about implementation of a screening program, predicting substantially greater harm in the community setting than was found in the NLST. Some comments expressed concern about the cost of implementing a screening program and the potential paradoxical effect of enabling persons to continue smoking with the perception that medical care can mitigate the risks of smoking.

In response to these comments, the USPSTF further emphasized the importance of tobacco cessation as the primary way to prevent lung cancer and provided links to resources that clinicians can use to help their patients quit smoking. A section on implementation of a screening program was added, emphasizing the need for monitoring this implementation, quality assurance in diagnostic imaging, and appropriate follow-up to replicate the benefits observed in the NLST in the general population. The USPSTF also clarified that, in addition to age and smoking history, such risk factors as occupational exposure, family history, and history of other lung diseases are important when assessing patients' risks for lung cancer.

The USPSTF acknowledges the importance of accurately identifying persons who are at highest risk to maximize the benefits and minimize the harms of screening and calls for more research to improve risk assessment tools. The USPSTF did not incorporate the costs of a screening program or the potential savings from a reduction in treatment of advanced lung cancer into the recommendation.

Recommendations of Others. Recommendations for screening from the following groups were discussed: the American College of Chest Physicians; the American Society of Clinical Oncology; American Thoracic Society; American Association for Thoracic Surgery; the American Cancer Society; and the National Comprehensive Cancer Network.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The type of evidence supporting the recommendations is not specifically stated.

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Benefits of Detection and Early Treatment

Although lung cancer screening is not an alternative to smoking cessation, the U.S. Preventive Services Task Force (USPSTF) found adequate evidence that annual screening for lung cancer with low-dose computed tomography (LDCT) in a defined population of high-risk persons can prevent a substantial number of lung cancer–related deaths. Direct evidence from a large, well-conducted, randomized, controlled trial (RCT) provides moderate certainty of the benefit of lung cancer screening with LDCT in this population. The magnitude of benefit to the person depends on that person's risk for lung cancer because those who are at highest risk are most likely to benefit. Screening cannot prevent most lung cancer–related deaths, and smoking cessation remains essential.

Potential Harms

Harms of Detection and Early Intervention and Treatment

- The harms associated with low-dose computerized tomography (LDCT) screening include false-negative and false-positive results, incidental findings, overdiagnosis, and radiation exposure. False-positive LDCT results occur in a substantial proportion of screened

persons; 95% of all positive results do not lead to a diagnosis of cancer. In a high-quality screening program, further imaging can resolve most false-positive results; however, some patients may require invasive procedures.

- The U.S. Preventive Services Task Force (USPSTF) found insufficient evidence on the harms associated with incidental findings. Overdiagnosis of lung cancer occurs, but its precise magnitude is uncertain. A modeling study performed for the USPSTF estimated that 10% to 12% of screen-detected cancer cases are overdiagnosed—that is, they would not have been detected in the patient's lifetime without screening. Radiation harms, including cancer resulting from cumulative exposure to radiation, vary depending on the age at the start of screening; the number of scans received; and the person's exposure to other sources of radiation, particularly other medical imaging.

Qualifying Statements

Qualifying Statements

- The U.S. Preventive Services Task Force (USPSTF) makes recommendations about the effectiveness of specific clinical preventive services for patients without related signs or symptoms.
- It bases its recommendations on the evidence of both the benefits and harms of the service and an assessment of the balance. The USPSTF does not consider the costs of providing a service in this assessment.
- The USPSTF recognizes that clinical decisions involve more considerations than evidence alone. Clinicians should understand the evidence but individualize decision making to the specific patient or situation. Similarly, the USPSTF notes that policy and coverage decisions involve considerations in addition to the evidence of clinical benefits and harms.
- Recommendations made by the USPSTF are independent of the U.S. government. They should not be construed as an official position of the Agency for Healthcare Research and Quality or the U.S. Department of Health and Human Services.

Implementation of the Guideline

Description of Implementation Strategy

The experiences of the first and second U.S. Preventive Services Task Force (USPSTF), as well as that of other evidence-based guideline efforts, have highlighted the importance of identifying effective ways to implement clinical recommendations. Practice guidelines are relatively weak tools for changing clinical practice when used in isolation. To effect change, guidelines must be coupled with strategies to improve their acceptance and feasibility. Such strategies include enlisting the support of local opinion leaders, using reminder systems for clinicians and patients, adopting standing orders, and audit and feedback of information to clinicians about their compliance with recommended practice.

In the case of preventive services guidelines, implementation needs to go beyond traditional dissemination and promotion efforts to recognize the added patient and clinician barriers that affect preventive care. These include clinicians' ambivalence about whether preventive medicine is part of their job, the psychological and practical challenges that patients face in changing behaviors, lack of access to health care or of insurance coverage for preventive services for some patients, competing pressures within the context of shorter office visits, and the lack of organized systems in most practices to ensure the delivery of recommended preventive care.

Dissemination strategies have changed dramatically in this age of electronic information. While recognizing the continuing value of journals and other print formats for dissemination, the USPSTF will make all its products available through its Web site . The combination of electronic access and extensive material in the public domain should make it easier for a broad audience of users to access USPSTF materials and adapt them for their local needs. Online access to USPSTF products also opens up new possibilities for the appearance of the annual, pocket-size Guide to Clinical Preventive Services.

To be successful, approaches for implementing prevention have to be tailored to the local level and deal with the specific barriers at a given site, typically requiring the redesign of systems of care. Such a systems approach to prevention has had notable success in established staff-model health maintenance organizations, by addressing organization of care, emphasizing a philosophy of prevention, and altering the training and incentives for clinicians. Staff-model plans also benefit from integrated information systems that can track the use of needed services and generate automatic reminders aimed at patients and clinicians, some of the most consistently successful interventions. Information systems remain a major challenge for individual clinicians' offices, however, as well as for looser affiliations of practices in network-model managed care and independent practice associations, where data on patient visits, referrals, and test results are not always centralized.

Implementation Tools

Foreign Language Translations

Mobile Device Resources

Patient Resources

Pocket Guide/Reference Cards

Staff Training/Competency Material

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Staying Healthy

IOM Domain

Effectiveness

Patient-centeredness

Identifying Information and Availability

Bibliographic Source(s)

U.S. Preventive Services Task Force (USPSTF). Screening for lung cancer: U.S. Preventive Services Task Force recommendation statement. Ann Intern Med. 2014 Mar 4;160(5):330-8. [21 references] PubMed

Adaptation

Not applicable: The guideline is not adapted from another source.

Date Released

1996 (revised 2014 Mar 4)

Guideline Developer(s)

U.S. Preventive Services Task Force - Independent Expert Panel

Guideline Developer Comment

The U.S. Preventive Services Task Force (USPSTF) is a federally-appointed panel of independent experts. Conclusions of the USPSTF do not

necessarily reflect policy of the U.S. Department of Health and Human Services (DHHS) or its agencies.

Source(s) of Funding

The U.S. Preventive Services Task Force (USPSTF) is an independent, voluntary body. The U.S. Congress mandates that the Agency for Healthcare Research and Quality support the operations of the USPSTF.

Guideline Committee

U.S. Preventive Services Task Force (USPSTF)

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**Members of the Task Force at the time this recommendation was finalized. For a list of current Task Force members, go to http://www.uspreventiveservicestaskforce.org/Page/Name/our-members*.

Financial Disclosures/Conflicts of Interest

The U.S. Preventive Services Task Force (USPSTF) has an explicit policy concerning conflict of interest. All members disclose at each meeting if they have a significant financial, professional/business, or intellectual conflict for each topic being discussed. USPSTF members with conflicts may be recused from discussing or voting on recommendations about the topic in question.

Potential Conflict of Interest: Disclosure forms from USPSTF members can be viewed at http://www.acponline.org/authors/icmje/ConflictOfInterestForms.do?msNum=M13-2771.

Guideline Status

This is the current release of the guideline.

This updates previous versions: U.S. Preventive Services Task Force. Lung cancer screening: recommendation statement. Ann Intern Med. 2004 May 4;140(9):738-9.

Lung cancer screening: recommendation statement. Am Fam Physician. 2005 Mar 15;71(6):1165-8.

This guideline meets NGC's 2013 (revised) inclusion criteria.

Guideline Availability

Electronic copies: Available from the Annals of Internal Medicine Web site.

Availability of Companion Documents

The following are available:

Evidence Reviews:

- Humphrey L, Deffebach M, Pappas M, Baumann C, Artis K, Priest Mitchell J, Zakher B, Fu R, Slatore C. Screening for lung cancer: systematic review to update the U.S. Preventive Services Task Force Recommendation. Evidence synthesis No. 105. AHRQ Publication No. 13-05188-EF-1. Rockville (MD): Agency for Healthcare Research and Quality; 2013. 243 p.
- Humphrey LL, Deffebach M, Pappas M, Baumann C, Artis K, Mitchell JP, Zakher B, Fu R, Slatore CG. Screening for lung cancer with low-dose computed tomography: a systematic review to update the U.S. Preventive Services Task Force Recommendation. Ann Intern Med. 2013;159(6):411-20.
- de Koning HJ, Meza R, Plevritis SK, ten Haaf K, Munshi VN, Jeon J, Erdogan SA, Kong CY, Han SS, van Rosmalen J, Choi SE, Pinsky PF, de Gonzalez AB, Berg CD, Black WC, Tammemagi MC, Hazelton WD, Feuer EJ, McMahon PM. Benefits and harms of computed tomography lung cancer screening strategies: a comparative modeling study for the U.S. Preventive Services Task Force. Ann Intern Med. 2014;160(5):311-20.
- de Koning HJ, Meza R, Plevritis SK, ten Haaf K, Munshi VN, Jeon J, Erdogan SA, Kong CY, Han SS, van Rosmalen J, Choi SE, Miller M, Moolgavkar S, Pinsky PF, Berg CD, Berrington de Gonzalez A, Black WC, Tammemagi CM, Hazelton WD, Feuer EJ, McMahon PM. Benefits and harms of computed tomography lung cancer screening programs for high-risk populations. AHRQ Publication No. 13-05196-EF-2. Rockville (MD): Agency for Healthcare Research and Quality; 2013. 18 p.

Electronic copies: Available from the U.S. Preventive Services Task Force (USPSTF) Web site.

Background Articles:

- Barton MB et al. How to read the new recommendation statement: methods update from the U.S. Preventive Services Task Force. Ann Intern Med 2007;147:123-127.
- Guirguis-Blake J et al. Current processes of the U.S. Preventive Services Task Force: refining evidence-based recommendation development. Ann Intern Med 2007;147:117-122.
- Sawaya GF et al. Update on the methods of the U.S. Preventive Services Task Force: estimating certainty and magnitude of net benefit. Ann Intern Med 2007;147:871-875.

Electronic copies: Available from the USPSTF Web site.

The following are also available:

- Screening for lung cancer. Clinical summary of U.S. Preventive Services Task Force recommendation. 2013. 1 p. Electronic copies: available from the USPSTF Web site.
- A continuing medical education (CME) activity is available from the Annals of Internal Medicine Web site.
- The guide to clinical preventive services, 2012. Recommendations of the U.S. Preventive Services Task Force. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ), 2012. 128 p. Electronic copies available from the AHRQ Web site. See the related QualityTool summary on the Health Care Innovations Exchange Web site.

The Electronic Preventive Services Selector (ePSS) is an application designed to provide primary care clinicians and health care teams timely decision support regarding appropriate screening, counseling, and preventive services for their patients. It is based on the current, evidence-based recommendations of the USPSTF and can be searched by specific patient characteristics, such as age, sex, and selected behavioral risk factors.

Patient Resources

The following are available:

- Screening for lung cancer. Understanding task force recommendations. Rockville (MD): U.S. Preventive Services Task Force. Consumer fact sheet. 2013 Dec. 4 p. Electronic copies: Available from the U.S. Preventive Services Task Force (USPSTF) Web site.
- Screening for lung cancer: recommendations from the U.S. Preventive Services Task Force. Summaries for patients. Ann Intern Med.

2014;160(5):I-40. Available from the Annals of Internal Medicine Web site .

- Women: stay healthy at any age. Rockville (MD): Agency for Healthcare Research and Quality. AHRQ Pub. No. 10-IP002-A. 2010 Aug. 2 p. Electronic copies: Available in Portable Document Format (PDF) in English and Spanish from the AHRQ Web site. See the related QualityTool summary on the Health Care Innovations Exchange Web site .
- Men: stay healthy at any age. Rockville (MD): Agency for Healthcare Research and Quality. AHRQ Pub. No. 10-IP004-A. 2010 Aug. 2 p. Electronic copies: Available in PDF in English and Spanish from the AHRQ Web site. See the related QualityTool summary on the Health Care Innovations Exchange Web site .

Print copies: Available in English and Spanish from the Agency for Healthcare Research and Quality (AHRQ) Publications Clearinghouse. For more information, go to http://www.ahrq.gov/research/publications/index.html or call 1-800-358-9295 (U.S. only).

Myhealthfinder is a tool that provides personalized recommendations for clinical preventive services specific to the user's age, gender, and pregnancy status. It features evidence-based recommendations from the USPSTF and is available at www.healthfinder.gov .

Please note: This patient information is intended to provide health professionals with information to share with their patients to help them better understand their health and their diagnosed disorders. By providing access to this patient information, it is not the intention of NGC to provide specific medical advice for particular patients. Rather we urge patients and their representatives to review this material and then to consult with a licensed health professional for evaluation of treatment options suitable for them as well as for diagnosis and answers to their personal medical questions. This patient information has been derived and prepared from a guideline for health care professionals included on NGC by the authors or publishers of that original guideline. The patient information is not reviewed by NGC to establish whether or not it accurately reflects the original guideline's content.

NGC Status

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